The ATC System Command Center

6. Air Traffic Services

Air traffic services provide safe and efficient access to the NAS. Air traffic services capabilities are discussed in detail in the following sections and are summarized in Table 1: Air Traffic Services Summary. The table provides a list of the service capabilities, the applicable flight domains, and some of the enabling system and procedure highlights. The enabling systems are discussed in detail in the related air traffic services section. Additionally, where applicable, for each capability, the related OEP Solution Sets are provided to highlight the correlation between the Architecture and the OEP.

Appendix B provides the current status and the future plans for additional NAS systems. Appendix C contains location information for selected systems.

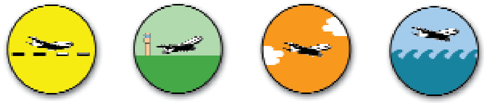
Table 1: Air Traffic Services Summary

Service	Capability	Flight Domain	Highlights
ATC Advisory	NAS Status Advisory	Surface, Terminal, En Route, Oceanic	FTI, NEXCOM, FIS-B
	Traffic Advisory	Surface, Terminal, En Route, Oceanic	TIS-B
	Weather Advisories	Surface, Terminal, En Route, Oceanic	ITWS, WARP, WSP, MIAWS, NEXRAD, FIS-B
ATC Separation Assurance	Aircraft-to-Airspace Separation	Terminal, En Route, Oceanic	STARS, CPDLC, ASR-11, ATCBI-6, ECG
	Aircraft-to-Aircraft Separation	Terminal, En Route, Oceanic	DRVSM, STARS, ATOP, ERAM, ADS-B, ADS-A, ASR-11, ATCBI-6, ECG
	Aircraft-to-Terrain Separation	Surface, Terminal, En Route	STARS, ERAM, ASR-11, ATCBI-6, ECG
	Surface Separation	Surface, Terminal	ASDE-3/AMASS, ASDE-X, ADS-B
Traffic Management Synchronization	Airborne Traffic Synchronization	Surface, Terminal, En Route, Oceanic	CTAS, URET, ATOP
	Surface Traffic Synchronization	Surface	SMA, SMS, ESMS
Navigation	Airborne Guidance	Terminal, En Route, Oceanic	WAAS, LAAS, GPS, RNAV, GBNA
	Surface Guidance	Surface	WAAS, LAAS, GPS, RIRP
Airspace Management	Airspace Design	Surface, Terminal, En Route, Oceanic	SDAT, NIRS
	Airspace for Special Use	Terminal, En Route, Oceanic	SAMS, MAMS
Emergency and Alerting	Alerting Support	Surface, Terminal, En Route, Oceanic	WAAS, GPS
	Emergency Assistance	Surface, Terminal, En Route, Oceanic	WAAS, GPS
Flight Planning	Flight Plan Processing	Surface, Terminal, En Route, Oceanic	OASIS, ATOP, ERAM
	Flight Plan Support	Pre-Flight	OASIS
Infrastructure/ Information Management	Government/ Agency Support	Surface, Terminal, En Route, Oceanic	
	Monitoring and Maintenance	Surface, Terminal, En Route, Oceanic	NIMS
	Spectrum Management	Surface, Terminal, En Route, Oceanic	NEXCOM
Traffic Management Strategic Flow	Current Performance Assessment	Surface, Terminal, En Route, Oceanic	POET, FSM
	Flight-Day Management	Surface, Terminal, En Route, Oceanic	POET, FSM, ETMS, CDM, CRCT, CCSD, CCFP, RMT, SMT, National Playbook
	Long-Term Planning	Terminal, En Route, Oceanic	POET, FSM, CDM, RMT, SMT

Air Traffic Control Advisory Services

ATC advisory services provide advice and information to assist pilots in the safe conduct of flight. The information provided to in-flight aircraft includes NAS status data as well as traffic and weather advisories.

NAS Status Advisory Capability

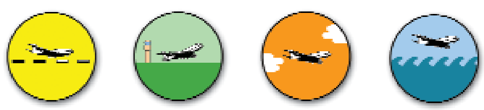


The NAS status advisory capability provides NAS status information for flight planning and during flight. This includes updates concerning the operational status of airspace, airports, navigational aids (navaids), in-flight or ground hazards, weather hazards, traffic management directives, and other information essential to the safety and efficiency of aircraft movement.

Modernization steps for this capability include a spectrum experiment involving two FIS providers and a demonstration of an affordable FIS for general aviation as part of the SF-21 initiative. FIS provides digital weather to the cockpit, presenting situational awareness advisories in both visual flight rules and instrument flight rules conditions. The evolution to a national FIS that will provide pilots with integrated and affordable FIS also is planned.

Aircraft cockpit

Traffic Advisory Capability



Traffic advisories are provided to alert a pilot to traffic in-flight or on the surface that may be in close proximity to the aircraft's position or route and may warrant the pilot's attention. Traffic advisories, for example, are provided to flights that are nearing other aircraft, terrain, military operations areas, hot air/gas balloons, and other potential hazards. Traffic advisories for aircraft on the surface may include the type, position, direction, and route of other ground traffic.

The modernization of this capability will include display of area traffic in the cockpit, including the broadcast of traffic information obtained from multiple types of surveillance sources.

Related OEP Solution Set
AD-7: Enhance Surface Situational Awareness

Weather Advisories Capability

Weather advisories and related information are provided to aircraft via broadcast from some facilities and upon pilot request at others. This capability includes information on hazardous weather conditions, such as thunderstorms, which pose a significant threat to aircraft.

Some highlights in the evolution of this capability include automatic simultaneous hazardous weather notification to provide the same weather information to controllers, traffic managers, airline dispatchers, and pilots. Finally, the national deployment of weather products will include dissemination in both text and graphical format to pilots en route via a service provider-maintained data link.

Related OEP Solution Sets

EW-1: Provide Better Hazardous Weather Data

AW-3: Reconfigure Airports Efficiently

Enabling Systems

The systems described below contribute to or enable the efficient delivery of the ATC advisory service.

Next Generation Air/Ground Communication System (NEXCOM)

The Next Generation Air/Ground Communication System (NEXCOM) is the FAA radio system of the 21st century. It is an analog/digital system incorporating the latest technological advances in radio communications. NEXCOM will use Very High Frequency (VHF) Digital Link - 3 (VDL-3) technology to provide additional voice and data communications channels; it also meets the demanding ICAO requirements for high reliability and low latency. NEXCOM will provide the capability to accommodate additional sectors and services; reduce logistics costs; replace outdated VHF and Ultra-High Frequency radios; provide data link communications capability; reduce Air/Ground Radio Frequency interference; and provide communication security mechanisms.

Current Status and Future Plans - In July 2001, the FAA awarded a contract to develop and produce a ground multimode digital radio. Under agreements with three vendors, the FAA will partially fund development of VDL-3 avionics. NEXCOM demonstration validation will be conducted and the NEXCOM production contract is expected to be awarded in 2005. A decision whether to authorize deployment of NEXCOM into the NAS is forecasted for 2007. If NEXCOM is implemented, over 46,000 radios will be installed throughout the NAS.

FAA Telecommunications Infrastructure (FTI)

The FAA Telecommunications Infrastructure (FTI) Program will replace the NAS interfacility and voice communications infrastructure, referred to as the NAS Interfacility Communications System (NICS), providing a virtual integrated telecommunications network infrastructure consistent with the current and future NAS Architecture. Replacement of aged FAA-owned assets and multiple FAA-managed leased service contracts will enable FTI to make state-of-the-art technology insertions required for modernization by numerous programs, while maintaining continuity with legacy systems.

FTI will provide universal access to commercial multimedia systems that meet FAA requirements for high availability, quality of service, and security at the lowest possible cost. Geographically, FTI will provide service in the Continental U.S., Alaska, Hawaii, southern Pacific, Caribbean, the Gulf of Mexico, and other international locations.

Current Status and Future Plans - The FTI contract was awarded in July 2002. The transition of services to FTI at over 5,000 FAA facilities is being planned. A phased transition of all services to FTI is scheduled to be complete by 2008.

Flight Information Service - Broadcast (FIS-B)

The FIS - Broadcast (FIS-B) will enhance pilot awareness of weather and airspace/facility status by incorporating broadcast flight information into cockpit multifunction displays. FIS products may include surface observations and warnings in a text format and graphical products. Additional aeronautical data exchange will include Notices to Airmen (NOTAM) and information about lightning, icing, turbulence, volcanic ash, and real-time Special Use Airspace (SUA).

Current Status and Future Plans - The FAA has established agreements with two companies to provide operational FIS. FIS data link is now operating in four 25 kilohertz (kHz) radio frequency channels in the 136.425-136.525 MHz VHF portion of the radio frequency spectrum. Hardware and system software packages have been certified for airborne operation. A set of core information has been approved and is being offered for sale.

Ground transmitter stations are being set up by both companies throughout the eastern U.S., and major flight routes to the west and the northwest coast are being established. As of August 2002, FIS data are being transmitted from over 90 sites in the Continental U.S. and three sites in Alaska. The plan is to complete enough stations in 2003 to enable coverage over most of the Continental U.S.

FIS-B is also being demonstrated in the SF-21 Capstone initiative. Flight information services include graphical weather depictions, as well as text-based weather and other information such as NOTAMs. FIS is being provided in Alaska via a UAT data link. Capstone UATs currently operate on 981 MHz as an interim frequency. All new UATs (Phase II equipment) will operate on 978 MHz and existing UATs will be modified to 978 MHz. As of August 2002, FIS data were being transmitted via ground-based transmitters at the following ten Alaskan sites: Aniak, Bethel, Cape Newenham, Cape Romanzof, Dillingham, King Salmon, St. Mary's, Sparrevohn, Site Summit, and Tatalina.

FIS-B will provide for the uplink of graphical weather services to pilots equipped with UAT and a suitable cockpit display where the ground infrastructure is deployed in the 2007 to 2012 timeframe.

Traffic Information Service - Broadcast (TIS-B)

TIS-B provides area traffic information to pilots. The TIS-B processor receives surveillance data from various sources, including primary and secondary surveillance radars, ADS-B, multilateration systems, ATC automation systems, and flight plan processing systems. ADS-B ground stations will broadcast traffic information data to the aircraft cockpit display.

Current Status and Future Plans - In June 2001, the FAA SF-21/Aircraft Owners and Pilots Association demonstration system began operation of a TIS-B system in the Washington, DC area. The TIS-B service was showcased for public viewing at the Association's 2001 Annual Maryland Fly-in. TIS-B tests are scheduled for Memphis in 2003. TIS-B will provide the same situational awareness to the pilot as to the controller for airport surface operations where multilateration services exist from 2007 to 2012.

Integrated Terminal Weather System (ITWS)

ITWS will provide products to Terminal aviation system users at the busiest NAS airports that will characterize the current Terminal weather situation and include a forecast of anticipated weather conditions for the next 20 minutes, eventually extending the forecast to 2 hours by 2006. This will be achieved by integrating weather data and products from various FAA and NWS sensors (e.g., Terminal Doppler Weather Radar [TDWR], ASR-9, NEXRAD, LLWAS-Network Expansion [LLWAS-NE], and Automated Surface Observing System [ASOS]), aircraft (via the Meteorological Data Collection and Reporting System), and other NWS gridded-weather model data. Products generated by ITWS include wind shear and microburst predictions, storm cell and lightning information, and Terminal area winds aloft. ITWS will provide controllers and traffic managers with enhanced weather products enabling them to mitigate avoidable weather-induced delays and increase system capacity.

Current Status and Future Plans - Prototypes are operating in Orlando, Dallas/Fort Worth, Memphis, and in the New York City area. Implementation of ITWS production systems began with installations completed in 2002 at Kansas City International, Atlanta's Hartfield, Miami, and Houston's Bush Intercontinental, which also provides coverage for Houston Hobby Airport.

Weather And Radar Processor (WARP)

WARP provides timely weather data acquisition and dissemination to support ATC and TFM. WARP is an automated processing system that continuously acquires, stores, distributes, and displays weather information and radar products from both internal and external sources.

Stages 1 and 2 of WARP were combined and broken into two phases. Phase 1 of Stage 1/2 was the deployment of the equipment to each ARTCC and the ATCSCC. Currently underway, Phase 2 entails the development and implementation of the DSR interface to provide En Route controllers with mosaics of NEXRAD weather imagery. The mosaics, which represent data from numerous radar systems, combine NEXRAD's eight levels of precipitation intensity into three levels for FAA air traffic controller use. WARP Stage 3 upgrades further enhance weather support to NAS operations with cost-effective sharing of weather products to NAS service providers, users, and automation systems. Implemented in 2002, a WARP sub-system called Weather Information Network Server (WINS) facilitates "common situational awareness" among operational decisionmakers of weather impacts on En Route NAS operations. Also, these upgrades enable WARP to use improved input weather model and sensor data, yielding improved weather products.

Current Status and Future Plans - WARP Stage 1/2 Phase 1 systems are operational at all ARTCCs and the ATCSCC. These systems replaced portions of the leased, vendor-provided WARP Stage 0 and enable WARP to receive NEXRAD radar data directly. Stage 1/2 Phase 2 is scheduled to be complete late in 2002. The Fort Worth center became the first facility with operational NEXRAD mosaics on DSR in May 2002. Some of WARP Stage 3 was implemented early at seven ARTCCs in 2001 to support FFP1. Stage 3 activities continue to develop crucial NAS interfaces to other NAS systems (e.g., ITWS, Operational and

Supportability Implementation System [OASIS], and Enhanced Traffic Management System [ETMS]).

Weather Systems Processor (WSP)

Weather satellite photo of Continental U.S.

WSP is a modification enhancement to the ASR-9 Terminal surveillance radar, enabling it to process data from the six-level weather channel. The mission of the WSP is to improve safety by warning Terminal controllers and pilots of hazardous wind shear and microburst events near runways. The system also will be used to predict the arrival of gust fronts and to track storm motion, giving a complete picture of current and future Terminal area hazardous weather conditions that may impact runway usage. WSP is intended for medium air-traffic density airports with high wind shear exposure not covered by TDWR. The system improves Terminal area flight safety.

Current Status and Future Plans - System deployment began in 2001. Deployment and commissioning of all 34 operational systems is scheduled to be complete in early 2003. WSP enhances the ASR-9 radar system that will be undergoing a SLEP in the 2005 to 2008 timeframe.

Medium Intensity Airport Weather System (MIAWS)

MIAWS will provide Terminal controllers with a real-time display of storm positions and estimated storm track products from NEXRAD data at LLWAS-RS sites to address weather information deficiencies at airports with too few flight operations to warrant a Doppler weather radar system. Using WSP display technology, MIAWS will not only display six levels of precipitation intensity, but will also alert tower controllers when moderate or severe weather threatens airport operations.

Current Status and Future Plans - MIAWS prototypes are located in Jackson, MS and Memphis, TN. Two additional prototypes were added in Little Rock, AR and Springfield, MO in the summer of 2002. During prototype development, the feasibility of relaying MIAWS products to the cockpit via Terminal Weather Information for Pilots (TWIP) and to airline dispatchers will be determined. Tentative plans are to install MIAWS at 40 LLWAS-RS sites.

Next Generation Weather Radar (NEXRAD)

NEXRAD provides a national network of Doppler weather radar systems to detect, process, and distribute hazardous and routine weather information for use by the DOT, DOC, and DoD.

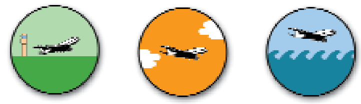
Current Status and Future Plans - There are 164 NEXRAD systems. Each agency shares operating/maintenance costs, including algorithm development, to improve system performance and provide new products. The 12 systems owned by the FAA are located in Alaska (7), Hawaii (4), and Puerto Rico (1).

NEXRAD open-systems product improvements will enhance network capacity, and will incorporate algorithms enabling shorter refresh rate times and advanced methods of detecting weather hazards.

ATC Separation Assurance Service

The separation assurance service ensures that aircraft maintain a safe distance from other aircraft, terrain, obstacles, and certain airspace not designated for routine air travel. Separation assurance involves applying separation standards to ensure safety. New automation systems, including STARS, ATOP, and ERAM, will improve these services. Additionally, GPS and ADS-B technologies offer improved surveillance data used in the delivery of this service.

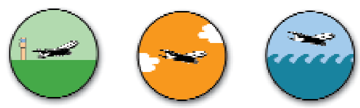
Aircraft-to-Airspace Separation Capability



Aircraft are separated from SUA, such as prohibited, restricted, and warning areas. The SUA is designed to ensure safety for unique aircraft operations or to prohibit flight within a specified area. Separation standards ensure that aircraft remain at an appropriate distance from the SUA.

The FAA began development of the Falcon View automation system in January 2001 to provide an automated platform to coordinate SUA information between DoD and FAA. The testing and operational procedures will be complete by October 2002.

Aircraft-to-Aircraft Separation Capability



The aircraft-to-aircraft separation assurance capability ensures that aircraft maintain a safe distance from other aircraft and vehicles. Separation standards are employed to ensure safety and are defined for aircraft operating in different environments.

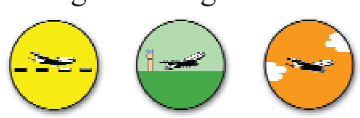
Evolution in this area includes efforts to reduce current aircraft separation standards that will increase the NAS capacity while maintaining safety. The objective of Domestic RVSM (DRVSM) is to implement RVSM in the vertical strata of the airspace of the contiguous 48 States and Alaska, and in Gulf of Mexico airspace where the FAA provides air traffic services (Houston and Miami Oceanic Flight Information Regions and Jacksonville Offshore Airspace).

Surveillance sources, including ADS, will be integrated to provide more accurate position and intent data. Additionally, data link technologies will increase the efficiency of controller and pilot routine message exchange.

Related OEP Solution Sets

- AD-1: Runway Additions Allow Improved Airport Configurations
- AD-2: Use Crossing Runway Procedures
- ER-3: Reduce Voice Communication
- ER-4: Reduce Vertical Separation
- ER-5: Reduce Offshore Separation
- ER-6: Reduce Oceanic Separation

Aircraft-to-Terrain Separation Capability



The NAS employs defined separation standards to prevent aircraft collision with terrain or obstacles. Methods include publishing safety zones and processing position and intent information. This area will evolve to provide low-cost terrain avoidance information to pilots.

Surface Separation Capability

Air traffic controllers in the tower provide separation assurance between aircraft, aircraft and vehicles, and aircraft and obstructions on runways. Pilots use "see-and-avoid" procedures on taxiways and follow instructions provided by air traffic controllers.

Common situational awareness and surveillance data fusion will lead to improvements in surface separation. ADS-B will provide accurate position reports for equipped aircraft. Multilateration will provide position reports for all aircraft and vehicles having tagged beacon transmitters. ADS-B and multilateration position reporting will be combined with ASDE primary radar in ASDE-X, resulting in improved surveillance data.

Related OEP Solution Sets

AD-6: Coordinate for Efficient Surface Movement
AD-7: Enhance Surface Situational Awareness
AW-2: Space Closer to Visual Standards

Enabling Systems

The systems described below contribute to or enable the efficient delivery of the ATC separation assurance service.

Standard Terminal Automation Replacement System (STARS)

STARS is a modern TRACON automation system that processes primary and secondary radar information to acquire and track aircraft position for display to controllers. STARS incorporates safety tools including conflict alert, Mode C intruder, final monitoring aid, minimum safe altitude warning, converging runway display aid, and controller automated spacing aid. STARS will also offer improved radar processing, GPS compatibility, adaptive routing, link implementation, improved weather display, and better utilization of traffic management information.

Current Status and Future Plans - STARS Early Display Configurations are operational at El Paso and Syracuse TRACONs. See the STARS Home Page for additional information.

Controller-Pilot Data Link Communications (CPDLC)

CPDLC provides for the digital transmission and reception of messages between pilots and controllers. The implementation of CPDLC is a joint effort between the Federal government and industry. Capabilities are being phased incrementally into ATC operations. Achieving benefits from CPDLC depends on both the government developing the required ground infrastructure and aircraft operators voluntarily equipping with and using CPDLC.

Current Status and Future Plans - Controllers have been trained at the Miami ARTCC for a Build I operational evaluation scheduled for 2002. This evaluation will use the following four message service types: transfer of communications, initial contact, altimeter setting, and menu text.

Build IA will expand the message set to include the following controller-initiated uplink services: altitude assignment, speed assignment, heading assignment, crossing restrictions, and route clearance, as well as a capability to handle pilot-initiated altitude requests. Build IA initial daily use is planned for December 2005, which will be followed by national deployment.

Airport Surveillance Radar - Model 11 (ASR-11)

The ASR-11 is a short-range radar system with a 60 nautical mile (nmi) detection range for medium and small activity airports. The ASR-11 provides advanced digital primary radar including weather intensity surveillance with an integrated, monopulse, secondary surveillance radar system for use in the TRACON area.

The ASR-11 will improve system efficiency and availability of service in the NAS by replacing existing ASR-7/8 systems and associated ATCBI-4/5.

Current Status and Future Plans - Twenty-nine ASR-11 sites have been selected, environmental activities at 17 sites have been completed, and construction has begun at 5 sites. Systems are being procured via a joint DoD/FAA development contract. A total of 116 systems, including 2 mobile and 2 support, will be commissioned by 2009.

Air Traffic Control Beacon Interrogator - Model 6 (ATCBI-6)

The ATCBI-6 is a ground-based system that interrogates transponders, receives and processes replies from transponders, determines the range and azimuth to the aircraft, and forwards the information to appropriate ATC automation systems. Replies provide transponder identification and altitude data. The ATCBI-6 will replace aging ATCBI equipment (Models 4 and 5) to maintain ground surveillance and decrease supportability costs.

Current Status and Future Plans - The ATCBI-6 production decision was made in July 2000. The first commissioning was at the key site, Tinker Air Force Base, in July 2002. The final system, in Yakutat, AK, will be commissioned in 2006. Current plans are for the procurement of 124 operational and 3 support systems.

Advanced Technologies and Oceanic Procedures (ATOP)

ATOP will provide the Oceanic and offshore air traffic communities with internationally compatible ATM services. ATOP will replace the Oceanic systems at the Anchorage, New York, and Oakland centers, which handle air traffic in international airspace over the Pacific and Atlantic oceans. ATOP will collect, manage, and display Oceanic air traffic data, including electronic flight strip data on the computer displays used by air traffic controllers, and integrate capabilities such as flight data processing, radar data processing, and ADS.

Current Status and Future Plans - ATOP Build I is being installed in Oakland in 2002 and is on track for IOC in April 2003. New York Build I IOC is scheduled for December 2003. Build II for Anchorage is scheduled for IOC in April 2004.

En Route Automation Modernization (ERAM)

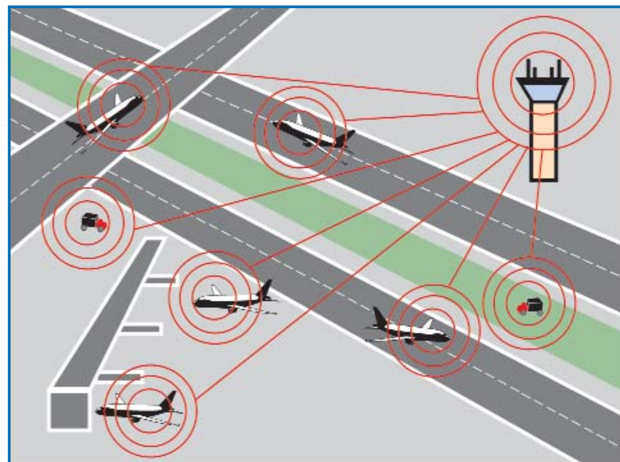
ERAM replaces the current primary En Route automation systems (HCS and Direct Access Radar Channel [DARC], respectively) and the Local Area Network (LAN)-based infrastructure Host Interface Device (HID) NAS LAN (HNL). The HCS hardware will reach end of service life in 2008, and the next generation hardware will no longer support the legacy operating system for which the NAS software was designed in 1970. Similarly, HNL will reach end of service life in 2003. ERAM will replace current HCS and DARC hardware and NAS software. The new NAS software will be consistent with NAS Architecture and provide a new Flight Data Processor (FDP) for processing ICAO flight plans and a new Surveillance Data Processor (SDP) for processing ADS-B. ERAM will replace the HNL with new industry standard infrastructure and interfaces.

Replacement of HCS and DARC will be accompanied by replacement of the current Monitor and Control (M&C) system as well. The new M&C will be extensible, capable of being used by other En Route systems, and will be a step towards realizing an Integrated M&C for the En Route domain.

Current Status and Future Plans - The ERAM contract award is planned for March 2003. The system will be installed in all ARTCCs by 2008.

Airport Movement Area Safety System/Airport Surface Detection Equipment - Model 3 (AMASS/ASDE-3)

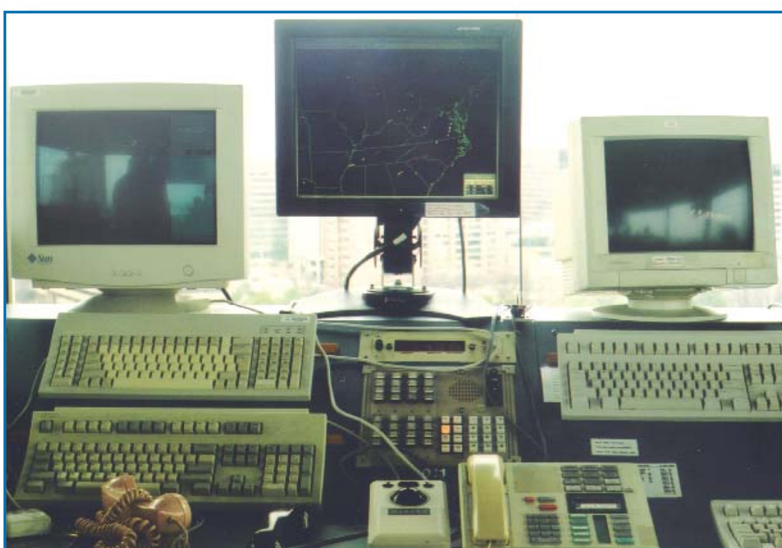
AMASS is an add-on enhancement to the host ASDE-3 radar. ASDE-3 provides radar surveillance of aircraft and airport surface vehicles at high activity airports. AMASS/ASDE-3 provides automated alerts and warnings of potential runway incursions and other hazards to controllers, improving surface movement safety. AMASS interfaces with existing ASR-9 and ARTS automation equipment.



Many systems aid tower controllers in managing surface traffic

Current Status and Future Plans - All 37 operational AMASS units have been delivered. Thirteen AMASS systems are commissioned, another six are in operational use. The last operational readiness demonstration is scheduled for September 2003 in Houston.

Airport Surface Detection Equipment - Model X (ASDE-X)



Tower displays

ASDE-X is a modular surface surveillance system capable of processing radar, multilateration, and ADS-B sensor data. The system provides seamless airport surface surveillance to air traffic controllers. ASDE-X will be deployed at airports that are not covered by ASDE-3/AMASS. The ASDE-X system depicts aircraft vehicle position and identification information overlaid on a color map showing the surface movement area and arrival corridors.

Current Status and Future Plans - ASDE-X is scheduled to be installed at 25 airports. Additionally, ASDE-X technology is scheduled to be added to selected ASDE-3/AMASS locations. ASDE-X will support ADS-B and TIS-B as commercial aircraft equip with ADS-B in the 2007 to 2012 timeframe.

Automatic Dependent Surveillance - Addressable (ADS-A)

ADS - Addressable (ADS-A) enables equipped aircraft to provide periodic position reports automatically via data link. ADS-A avionics are devices that, upon reception of messages specifically addressed to the aircraft, compose and transmit a response message specifically addressed to the interrogator. The message contains the current position of the aircraft as determined by onboard navigation equipment, the aircraft identification, and short-term planned course changes. The primary use of ADS-A is in Oceanic areas.

Current Status and Future Plans - The Oceanic Data Link system is installed at the Oakland, New York, and Anchorage centers.

Automatic Dependent Surveillance - Broadcast (ADS-B)

ADS-B technology provides for the broadcast of information via digital data link between a source and multiple destinations. Aircraft equipped with ADS-B avionics broadcast their position as determined by onboard navigation avionics. This will be a precise location for aircraft equipped with GPS (or GPS/WAAS) avionics, or a less accurate position if derived from ground-based navaids or the aircraft's inertial navigation sensors. Other data, including airspeed, altitude, and planned course changes, may also be transmitted. Receivers on the ground, as well as ADS-B avionics aboard other aircraft, receive this broadcast information. The information can then be processed and displayed to the controller or the pilot, providing a picture of area traffic.

Current Status and Future Plans - Phase I of the Capstone program initiated daily use of ADS-B technology to track and service traffic in areas with no radar coverage. Over 160 aircraft are equipped with ADS-B avionics, and 10 ground stations are operational. Phase I of the Capstone program will extend through December 31, 2004. The second phase of Capstone is about to begin in the Juneau area. Up to 200 aircraft, both fixed-wing and rotary, will be equipped with the Phase II avionics.

The FAA, responding to U.S. aviation industry requests received via the Free Flight Steering Committee, announced in July 2002 the architecture selected for ADS-B. The FAA, having completed the evaluation of the alternative ADS-B technologies, selected an ADS-B architecture that utilizes a combination of the 1090 MHz Extended Squitter ADS-B link for air carrier and private/commercial operators of high-performance airframes, and the UAT ADS-B link for typical GA users.

The ground infrastructure will be deployed from 2007 to 2012 to provide ADS-B air-to-ground surveillance services and ground-to-air uplink broadcast services over 1090 MHz Extended Squitter and UAT. Over the same time period, the commercial aircraft fleet will complete ADS-B equipage. Air carrier fleets will achieve the intended initial ADS-B benefits in the Terminal and En Route airspace in the post-2012 timeframe.

Domestic Reduced Vertical Separation Minima (DRVSM)

NAS capacity can be increased by reducing separation standards, thus allowing more aircraft in a volume of airspace. RVSM reduces the vertical separation above flight level (FL) 290 from the current 2,000-ft minimum to a 1,000-ft minimum. This increases airspace capacity and allows aircraft to fly optimal profiles and save fuel. Increased altimetry accuracy is needed at and above FL290 to permit separation less than the current standard.

> "By allowing aircraft greater flexibility to fly at different altitudes, airlines and general aviation alike can save time and reduce their costs while we improve the safety and efficiency of the system. It's a win-win situation for all sectors of the aviation community."
>
> Norman Y. Mineta,
> Secretary
> U.S. Department of Transportation

Current Status and Future Plans - RVSM was first introduced over the North Atlantic in 1997. Since then, RVSM has been implemented on routes over the Pacific Ocean and Australia. In early 2002, RVSM was introduced over Continental Europe and the South China Sea.

Plans are being made to introduce DRVSM. The FAA published a Notice of Proposed Rulemaking in the *Federal Register* on RVSM on May 10, 2002, which announced the FAA intention to implement DRVSM in December 2004. By then, the agency estimates, greater than 90 percent of flights between 29,000 and 41,000 feet will be made by RVSM-compliant aircraft.

En Route Communications Gateway (ECG)

The En Route Communications Gateway (ECG) will be deployed in a phased development/implementation. ECG Phase 1 will replace the existing Peripheral Adapter Module Replacement Item (PAMRI), which is reaching the end of its service life. PAMRI provides the interface between the Host and the DARC and nearly all external interfaces. The PAMRI basic function is to take incoming information from many narrow bandwidth telecommunications lines and multiplex them into wider bandwidth channels. The inverse function is performed with respect to outbound information. These interfaces include all of the radars, external flight data input (Flight Service Stations, Flight Data Input/Outputs [FDIOs], Direct User Access Terminals [DUATs]), adjacent ARTCC and TRACON automation systems, DoD base operations, North American Aerospace Defense Command (NORAD), and Customs Service, among others. PAMRI also provides an intra-ARTCC high-speed parallel interface to local ETMS, the National Airspace Data Interchange Network (NADIN) concentrator and limited flight data transfer between the Host and the DARC.

Subsequent Phases of ECG will be deployed to overcome PAMRI limitations to meet the needs of En Route modernization. Many of the planned applications for the future En Route automation needs comprise newer and different local and remote interfaces. The existing PAMRI is limited to the existing interfaces with their antiquated physical layer connectivity, transmission media, communications protocols, speeds, and information content. This applies not only to the external inputs (surveillance sensors, inter-facility interfaces with adjacent En Route and Terminal automation systems, FDIO, and the military), but also to the major local systems: the existing Host and DARC and the ERAM system.

The subsequent phases of ECG will support simultaneously the existing interfaces and the new interfaces. Most importantly, it will support a lengthy transition period where both old and new interfaces will be accommodated until each system (local and remote) is upgraded and operational confidence and proven reliability is demonstrated for each interface. The existing PAMRI will not meet the quantity and type of interfaces required to support this transition. The ECG will support this transition and is necessary for ERAM improvements.

Current Status and Future Plans - ECG was approved and baselined by the Joint Resources Council on March 13, 2002. ECG is to be deployed at 20 ARTCCs, the William J. Hughes Technical Center, and the FAA Academy by the end of 2005.

Traffic Management Synchronization Service

Traffic synchronization supports expeditious flight for aircraft simultaneously using the NAS. NAS processes operate to maximize efficiency and capacity in response to weather, NAS infrastructure changes in status, runway availability, and other conditions. Traffic synchronization is the tactical portion of traffic management that provides sequencing, spacing, and routing of both airborne and surface aircraft. Traffic synchronization activities are accomplished while maintaining separation standards and implementing strategic flow management directives.

Airborne Traffic Synchronization Capability

Related OEP Solution Sets
AD-1: Runway Additions Allow Improved Airport Configurations
AD-4: Fill Gaps in Arrival and Departure Streams
AW-2: Space Closer to Visual Standards
ER-7: Accommodate User Preferred Routing

Airborne synchronization, or the spacing and sequencing of air traffic, safely maximizes the efficiency and capacity of the NAS throughout the departure, cruise, and arrival phases of flight. Maximum efficiency, predictability, and capacity are obtained by applying processes that reduce variability in achieving coordinated separation standards.

URET and TMA-SC help airborne traffic synchronization. Both tools will be deployed to additional locations in FFP2. Future evolution includes enhanced conflict probe and conflict resolution capabilities.

Surface Traffic Synchronization Capability

Related OEP Solution Set
AD-6: Coordinate for Efficient Surface Movement

Controllers, airline ramp coordinators, and pilots use procedural, visual, and automated means to provide surface synchronization. For example, controllers issue taxi clearances and instructions to provide optimal and predictable flows of traffic by communicating with pilots and vehicle operators on the surface.

New tools for airport surface traffic management will enable airport personnel to predict, plan, and advise surface aircraft movements. Animated airport surface displays for all vehicles on the ground will display real-time information to all parties of interest, supplementing available visual information. Additionally, improved decisionmaking capabilities for air traffic controllers will more effectively balance runway loads.

Enabling Systems

The systems described below contribute to, or enable, the efficient delivery of traffic management synchronization services. In addition to these systems, ATOP, used in the ATC separation assurance service, contributes to traffic management synchronization services.

User Request Evaluation Tool (URET)

URET is a conflict probe tool that enables controllers to manage user requests in En Route airspace by identifying potential aircraft-to-aircraft conflicts up to 20 minutes in the future. It also checks for and alerts controllers to conflicts between routes and SUA boundaries.

Current Status and Future Plans - Controllers at the Kansas City ARTCC began operational use of URET in December 2001. URET was implemented at the Memphis, Indianapolis, Cleveland, Chicago, and Washington centers in early 2002. URET receives gridded wind and temperature data from WARP WINS to optimize its performance. URET continues to produce user benefits through increased direct routings and reductions in static altitude restrictions. URET is scheduled to be installed in all En Route centers by 2004 under FFP2.

Traffic Management Advisor - Single Center (TMA-SC)

TMA-SC helps to optimize traffic flow in the extended airspace around an airport. It enables En Route controllers and traffic management specialists to develop complete arrival scheduling plans ("meter lists") of properly separated aircraft. These plans then support early runway assignments to maximize airport use of available capacity. TMA helps controllers optimize traffic flow into adapted airports and efficiently use available runways and surrounding airspace. Displays depict aircraft approaching runways and airspace in a timeline. Controllers can observe potential imbalances and use the data to suggest optimal solutions.

Current Status and Future Plans - Use of TMA-SC at the Fort Worth Center shows that it can increase the arrival rate into Dallas/Fort Worth International Airport by five percent. FFP2 will deploy TMA-SC to the Houston, Kansas City, Indianapolis, and Memphis centers.

Surface Movement Advisor (SMA)

SMA shares information with airline and airport personnel who plan and manage the flow of traffic on airline ramps. SMA provides current aircraft arrival information to ramp operators and managers. This information sharing improves efficiency by optimizing gate operations and ground support services while reducing taxi time and hold delays. SMA provides transitional capabilities that will ultimately be incorporated in the SMS.

Current Status and Future Plans - Under FFP1, SMA systems are operational in Chicago, Dallas/Fort Worth, Detroit, Teterboro, Newark, and Philadelphia. Success of the SMA system has led to FFP2 SMS development. SMA has also been deployed to additional TRACONs, including the North Georgia Large TRACON, New York, Philadelphia, Detroit, Gateway, Dallas/Fort Worth, Boston, Charlotte, Pittsburgh, Minneapolis, and Chicago TRACONs.

Surface Management System (SMS)

SMS is a decision support tool that will help controllers and users of the NAS manage the movement of aircraft on the surface of busy airports, thereby improving capacity, efficiency, flexibility, and safety. SMS will support cooperative planning of other arrival and departure traffic management decision support tools to provide additional benefits.

Current Status and Future Plans - SMS is being developed as part of FFP2 priority research. An SMS demonstration is planned for Memphis in 2003.

Enhanced Surface Management System (ESMS)

Enhanced SMS (ESMS) will enable users and providers to have access to flight planning, traffic management, arrival/departure, and weather information, giving a complete picture of airport operations. Using a perimeter "look-ahead" feature, the enhanced multifunctional displays will show conflict predictions between arriving aircraft and surface aircraft/vehicles. The goal is to have all airport operations, including ATC, aircraft, airline and AOCs, ramp control, and airport emergency centers, receiving and exchanging common surface movement data.

Current Status and Future Plans - ESMS is in concept development. The system architecture will be developed in the 2005 to 2008 timeframe following the deployment of ASDE-X and the Memphis demonstration.

Navigation Service

The navigation service provides guidance to allow NAS users with suitable avionics to operate their aircraft safely and efficiently under different weather conditions. The service includes both ground- and space-based networks of navaids for the NAS. These navaids broadcast electromagnetic signals in accordance with international standards. The navigation service provides guidance during airborne operations (i.e., cruise, approach, and landing) and during surface operations.

Airborne Guidance Capability

Related OEP Solution Sets

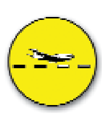
AD-1: Runway Additions Allow Improved Airport Configurations

AW-1: Maintain Runway Use in Reduced Visibility

The NAS provides signals in space through space-based mechanisms and ground-based systems for point-in-space navigation through a variety of operating environments. These environments include structured routes, random routings, and transitions.

Future plans include introducing systems to improve the accuracy of GPS position data for navigation and precision approaches.

Surface Guidance Capability



Airport surface guidance aids aircraft on the airport surface by providing taxiway and runway lighting; signage; markings; and obstacle identification.

Future enhancements include implementing lighting and signage emerging from R&D programs.

Enabling Systems

The systems described below contribute to or enable the efficient delivery of navigation services.

Global Positioning System (GPS)

GPS is a space-based radio-navigation system. It consists of ground monitoring and control stations and 24 satellites orbiting Earth at an altitude of approximately 11,000 miles. GPS provides users with accurate information on position, velocity, and time anywhere in the world and in all weather conditions.

GPS provides two levels of service: a Standard Positioning Service (SPS), which uses the L1 frequency (1575.42 MHz); and a Precise Positioning Service (PPS), which uses both the L1 and L2 (1227.60 MHz) frequencies. Access to the PPS is restricted to U.S. Armed Forces, U.S. Federal agencies, and selected allied armed forces and governments. These restrictions are based on national security considerations. The SPS is available to all users on a continuous, worldwide basis, free of any direct user charge.

The current NAS ground-based navigation system is costly to maintain and precludes many users from accruing the benefits of direct point-to-point navigation, optimum routing, and other capacity enhancing applications. The FAA has committed to approving GPS for civil aviation. However, at the present time, the requisite accuracy, integrity, availability, and continuity of the SPS must be augmented for GPS to be used in En Route and Terminal domains and for nonprecision and precision approaches. The FAA has initiated the WAAS and LAAS programs, described below, to provide such augmentation.

Current Status and Future Plans - GPS is fully operational. The DoD maintains a 24-satellite constellation, launching replacement satellites based on anticipated need.

The U.S. government has determined that two additional signals are essential for certain uses of GPS. A second civil signal will be added at the GPS L2 frequency. This signal will enable dual-frequency receivers to correct for ionospheric errors. The DoD plans to launch the first satellite with this new capability (Block IIR-M) in 2003. IOC (18 satellites in orbit) is planned for 2008 and full operational capability (FOC) with 24 satellites in orbit is planned for 2010.

A third civil signal to meet the needs of critical safety-of-life applications such as civil aviation will be added at 1176.45 MHz and is designated as L5. L5 can serve as a redundant signal to the GPS L1 frequency in order to ensure continuity of service to provide precision approach capability for aviation users. At least one satellite (Block IIF) is planned to be operational with the new L5 capability no later than 2005, with IOC planned for 2012 and FOC planned for 2014.

The GPS modernization program, besides adding the new L2 and L5 civil signals, will also procure an entirely new constellation of Block III GPS satellites. The Block III satellites will offer higher power military and civil signals, more accurate service for all users, and increased integrity. GPS III has the potential to meet a broad array of civil and military needs via GPS alone (i.e., without need for augmentation). Aviation applications are a key driver of Block III requirements. The first GPS III satellite is expected to be launched in 2009.

Wide Area Augmentation System (WAAS)

The FAA is developing WAAS to augment GPS for aviation users. WAAS provides a signal-in-space, broadcast from Geostationary Earth Orbit (GEO) satellites, to enable users to navigate En Route through precision approach phases of flight. The signal provides differential corrections of GPS and GEO satellites to improve ranging accuracy; availability and continuity; and data integrity. System coverage eventually will include the Continental U.S., Hawaii, Puerto Rico, and Alaska (except for the Alaskan peninsula west of 160° W longitude or outside of the GEO broadcast area).

Current Status and Future Plans - WAAS continuously broadcasts differential corrections and is available for non-safety applications. WAAS IOC for safety applications, expected in 2003, will support En Route navigation, nonprecision approach, and approach with Lateral Navigation/Vertical Navigation operations. After achieving IOC, WAAS will be incrementally improved to expand the area of coverage, increase the availability of nonprecision approaches and Area Navigation (RNAV), increase signal redundancy, reduce operational restrictions, and support precision approach operations. WAAS will ultimately incorporate the new GPS civil signal at L5 to provide a more robust and interference-resistant service to those users who equip with dual-frequency avionics. This expanded capability will support all phases of flight in the NAS except Category (CAT) II and III precision approaches.

Local Area Augmentation System (LAAS)

LAAS augments GPS by focusing navigation service in the airport area (approximately a 20-30 mile radius). LAAS broadcasts its correction message via a VHF radio data link from a ground-based transmitter. The system will yield the extremely high accuracy, availability, and integrity necessary for CAT I, II, and III precision approach applications. CAT I LAAS is being developed through government/ industry partnerships.

Current Status and Future Plans - Prototype CAT I LAAS units are installed and under evaluation at several sites, including Chicago's O'Hare and Midway, Memphis, Cedar Rapids, Minneapolis, Moses Lake Airfield in Washington, and Salt Lake City. An additional unit will be installed at New Century Airport in Kansas.

The FAA expects to award a contract for the production of CAT I LAAS systems in late 2002, with the first production systems delivered in 2004 and commissioned for public use in 2005. Technical studies, research, and specification development for CAT II/III LAAS are expected to continue through 2004. An investment decision will then determine whether to proceed with a contract for full-scale development and production of CAT II/III systems.

Ground-Based Navigational Aids (GBNA)

Navigation services are currently provided by unaugmented GPS and by a network of Ground-Based Navigational Aids (GBNA). VHF Omnidirectional Range (VOR) and Distance Measuring Equipment (DME) systems, and to a limited extent, the Loran-C system, support En Route navigation Aeronautical Nondirectional Beacons (NDB) support En Route navigation in Alaska and along limited Eastern coastal areas. The VOR and NDBs also support nonprecision approach operations at thousands of airports throughout the NAS. Tactical Air Navigation (TACAN) systems provide similar support to military users. CAT I, II, and III precision approach operations are supported primarily by the Instrument Landing System (ILS) equipment installed at hundreds of airports.

Current Status and Future Plans - Navigation service will continue to be provided by the legacy GBNA throughout and after transition to the augmented satellite-based services provided by GPS, WAAS, and LAAS. The FAA is working with the user community to determine the types and numbers of GBNA to retain to provide a level of redundant navigation service. Initial indications are that the FAA will sustain a full network of DME and TACAN, and a reduced network of VOR, NDB, and ILS. Loran-C's future is less certain and may depend on its value to other modes of transportation and as a timing reference system.

Area Navigation (RNAV)

RNAV is the application of the navigation process that provides the capability to establish and maintain a flight path on any chosen course that remains within the coverage area of navigation sources being used. Current Terminal airspace operations consist largely of controllers vectoring aircraft, which often causes large variations in the flight times of aircraft in the Terminal area. These variations can lead to extended flying paths, costing additional time and fuel, as well as reduced schedule predictability, resulting in passenger delays and disrupted flight schedules. Aircraft that are Flight Management System/RNAV-equipped can navigate precisely point-to-point, without flying directly over ground-based navaids. The introduction of RNAV routes throughout the NAS will result in reduced air/ground communications, improved schedule predictability, reduced flying time, potential fuel savings, and improved situational awareness for controllers and pilots.

Current Status and Future Plans - Many commercial aircraft already have an RNAV capability. The anticipated equipage with GPS avionics (including WAAS and LAAS) will make RNAV ubiquitous across the NAS. A recent example of a National Airspace Redesign (NAR) implementation of RNAV routes occurred in Las Vegas. In October 2001, the Las Vegas TRACON and Los Angeles Center implemented the Four Cornerpost Project (4CP); becoming the first major airport to use RNAV arrival and departure procedures for all runways, bringing an estimated combined savings of over $45 million in the first 12 months.

Runway Incursion Reduction Program (RIRP)

A runway incursion is any occurrence at an airport involving an aircraft, vehicle, person, or object on the ground that creates a collision hazard or results in loss of separation with an aircraft taking off, intending to take off, landing, or intending to land. Runway incursions may result from pilot deviations, operational errors, vehicle or pedestrian deviations, or operational deviations.

One of the FAA key safety initiatives is the reduction of runway incursions. The FAA is working with the aviation community to identify various educational programs and technological advances which will reduce incursions.

The FAA has instituted a Runway Incursion Reduction Program (RIRP) to increase the safety of aircraft and vehicle movement and decrease the potential for accidents on the airport surface. This program will explore, evaluate, and validate current and emerging technologies that show potential to increase runway safety in the NAS. Evaluation projects are assessing the technical and operational suitability of new concepts in surface traffic surveillance as well as pilot and controller situational awareness tools. Technologies under evaluation include:

- Inductive Loop Sensors - a non-radar based system for detecting surface vehicle movement;
- Multilateration and multisensor data fusion for the Surface domain; and
- Multisensor-driven Runway Status Lights - an automated system to provide aircrews real-time runway activity status alerts.

Airspace Management Service

The airspace management service ensures the proper and safe use of the national airspace. This includes the design, allocation, and stewardship of the airspace. Maximum safety and efficiency in using airspace result from coordinating airspace user needs and available capacity. Effective airspace management requires integration of airspace design and management of SUA.

The national airspace is a critical and limited resource. While aircraft, ATC systems, and technology in general have advanced significantly, the structure of the airspace has not changed appreciably in the past few decades.

In July 1998, the FAA began the first coordinated, comprehensive effort to redesign national airspace with the NAR project. With the evolution of operations and modernization of supporting systems, the FAA recognized the need to develop a consistent, cohesive approach for airspace redesign that would meet local and national objectives. The NAR is a systematic approach to increasing the efficiency and capacity of the NAS. Beginning with the New York/New Jersey Airspace Redesign, this effort is now implementing projects in the Great Lakes, Central, and Western Pacific Regions. The FAA recently completed evaluation periods for two major NAR projects, the New York flip-flop and the Las Vegas 4CP.

In New York, as part of the NAS Choke Points initiative, the FAA reversed, or "flip-flopped," routes for flights inbound to the New York LaGuardia and Newark Airports. The Choke Point program is a near-term NAR airspace improvement initiative that focuses on the creation of new procedures and changes to U.S. airspace in order to gain greater efficiency. The flip-flopped routes, at Yardley, PA and Robbinsville, NJ, are two points at which air traffic controllers align aircraft for approach to Newark and LaGuardia airports when they arrive from the south. ATC specialists at the New York TRACON now have greater flexibility to merge and sequence Newark arrivals.

The Las Vegas 4CP Phase I began in October 2001 and has performed well. The Las Vegas TRACON and Los Angeles Center worked together to make McCarran International Airport the first major airport to use RNAV arrival and departure procedures for all runways. Las Vegas has just begun implementing Phase II of the 4CP. The Las Vegas TRACON and Los Angeles Center will be adjusting and testing a variety of new RNAV routes to ensure arrivals and departures have an even smoother transition into and out of the terminal area.

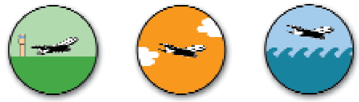
Airspace Design Capability

Airspace design provides maximum use of this national resource while ensuring safety. Airspace planning and analysis considers, among other elements, existing design, current and projected traffic usage, radio frequency congestion, effects of airport construction, proposed and existing surface structures, and environmental factors such as noise abatement.

Evolution toward controllers' ability to reconfigure airspace in real or near-real time, a capability referred to as dynamic resectorization, will occur.

Related OEP Solution Sets
AD-1: Runway Additions Allow Improved Airport Configurations
AD-3: Redesign Terminal Airspace and Routes
AD-5: Expand Use of 3-Mile Separation Standard
ER-1: Match Airspace Design to Demands
ER-2: Collaborate to Manage Congestion
ER-5: Reduce Offshore Separation

Airspace for Special Use Capability



Related OEP Solution Set
ER-8: Improve Access to Special Use Airspace

SUA includes prohibited, restricted, and warning areas. Airspace for special use supports the national defense mission, fosters development of commercial space enterprises, protects sensitive areas, and ensures protection of natural resources.

The FAA is working with the military concerning several pieces of SUA and obtaining more real-time access. Each of these efforts is pursued with the military on a case-by-case basis. The Buckeye Military Operations Area working group has been established to facilitate the process.

Enabling Systems

The systems described below contribute to or enable the efficient delivery of the airspace management service.

Sector Design Analysis Tool (SDAT)

The Sector Design Analysis Tool (SDAT) is an analytic tool that evaluates changes in airspace design and traffic routing. SDAT is a component of the SDAT Enterprise, an FAA-owned decision support tool for analysis and design of airspace and traffic flows. Its primary focus is supporting the activities undertaken by FAA airspace offices at local, regional, and national levels. SDAT applications include airspace visualization, traffic flow analysis, and model integration. The SDAT Enterprise tool suite currently consists of three components: SDAT, the high-end visualization and analysis tool; SDAT Construct, for data and project management; and AT Vista, an ATC display emulator.

Current Status and Future Plans - SDAT has been in use for several years and has recently become a component of SDAT Enterprise.

Noise Integrated Routing System (NIRS)

The Noise Integrated Routing System (NIRS) is a noise-assessment program designed to provide analyses of air traffic changes over broad areas. It works in conjunction with other air traffic modeling systems that provide the source of routes, events, and air traffic procedures such as altitude restrictions.

Current Status and Future Plans - NIRS software is available and will run with various operating systems on multiple platforms.

Special Use Airspace Management System (SAMS)

The SUA Management System (SAMS) is an automated system that supports integrated SUA schedule operations both within the FAA and between the FAA and the DoD. The SAMS processor receives airspace schedule messages from the Military Airspace Management System (MAMS).

Current Status and Future Plans - The SAMS processor is located at the ATCSCC; SAMS workstations are located at the ATCSCC, ARTCCs, towers, TRACONs, and Center Radar Approach Control facilities.

Military Airspace Management System (MAMS)

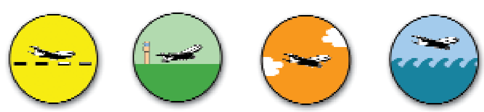
MAMS is an automated system that schedules and documents SUA and other related airspace utilization for the DoD. It receives airspace schedule messages from local DoD airspace scheduling agencies and transmits airspace schedule messages to SAMS.

Current Status and Future Plans - The MAMS central facility is located at Tinker Air Force Base, OK.

Emergency and Alerting Service

The emergency and alerting service monitors the NAS for distress or urgent situations, evaluates the nature of the situation, and provides an appropriate response. This service covers situations that occur on the ground or in-flight.

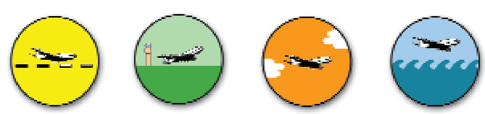
Alerting Support Capability



When an aircraft is overdue or missing, a communications search is initiated to determine when the aircraft last contacted an ATC facility.

Future improvements in this area include using satellite-based ADS-B technologies to provide controllers and search and rescue personnel with aircraft location information and discrete aircraft identification of downed or distressed aircraft.

Emergency Assistance Capability



Emergency assistance ranges from assisting aircraft low on fuel or aircraft involved in a hijacking to alerting rescue coordination agencies that an aircraft is overdue or missing.

There is currently no formal evolution planned for this capability. However, emergency assistance will benefit from most future NAS system improvements.

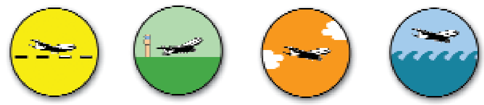
Enabling Systems

GPS and WAAS, also used in the navigation service, contribute to emergency and alerting services.

Flight Planning Service

The flight planning service supports the efficient use of the nation's airspace by developing and using coordinated flight plans. This includes preparing and conducting preflight and in-flight briefings, filing flight plans and amendments, managing flight plan acceptance and evaluation, preparing flight planning broadcast messages, and maintaining flight planning data archives. This service includes preparing initial flight plans and allowing changes to flight profiles while operating within the NAS.

Flight Plan Processing Capability



Flight plan processing provides acceptance and processing of flight plan data from all users (e.g., GA, commercial, military, and law enforcement), validates the flight plans, notifies users of any problems, and processes amendments, cancellations, and flight plan closures.

Evolution in flight plan processing includes plans to provide interactive feedback to NAS users on proposed flight plans based on current constraints. In the more distant future, the concept of flight objects and 4-Dimensional (4-D) trajectories will be introduced.

Flight Plan Support Capability

Flight plan support provides NAS users essential weather and aeronautical information. Flight planning requires information such as expected route, altitude, time of flight, available navigation systems, available routes, SUA restrictions, daily demand conditions, and anticipated flight conditions, including weather, sky conditions, and advisories (e.g., volcanic ash, smoke, and birds). Future plans for this capability include the automatic notification of SUA status to pilots.

Enabling Systems

OASIS contributes to or enables the efficient delivery of the flight planning service. In addition, ATOP and ERAM, used in the ATC separation assurance service, contribute to flight planning.

Operational and Supportability Implementation System (OASIS)

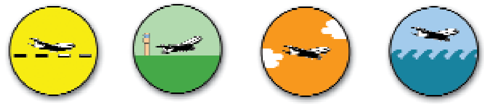
OASIS provides alphanumeric and graphic weather product acquisition and display, flight plan processing, NOTAMs, search and rescue services, administrative and supervisory capabilities, flight planning and regulatory information, and system maintenance functions. OASIS will enhance the safety and efficiency of the NAS by providing a single integrated solution for improved weather products, a modern graphical user interface, simultaneous display of weather graphics and alphanumeric flight route information, and integrated training capabilities. OASIS system hardware and software are provided to the FAA as a service and will be operated by flight service specialists 24 hours a day, 7 days a week.

Current Status and Future Plans - OASIS is operating at the Seattle Automated Flight Service Station (AFSS). OASIS will be installed throughout the U.S., including Alaska, Hawaii, and Puerto Rico. When fully deployed in 2006, OASIS will be installed at 61 AFSS sites. Three additional support systems will be available: two located at the FAA William J. Hughes Technical Center in Atlantic City and one at the FAA Mike Monroney Aeronautical Center in Oklahoma City.

Infrastructure/Information Management Service

Infrastructure/information management ensures NAS utility through infrastructure management and operation and optimal use of resources. Infrastructure resources include systems such as radar, communication links, navaids and automation, while information management includes NAS monitoring and maintenance.

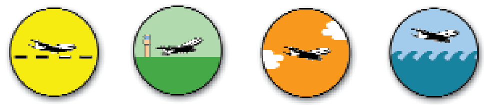
Government/Agency Support Capability



Government/agency support provides and coordinates information. The NAS supports DoD operations, law enforcement missions, government land management agencies, firefighting operations, and State aviation managers.

No formal evolution is planned for this capability. However, recent events have made the coordination between government agencies even more critical. The FAA will contribute to this increased coordination.

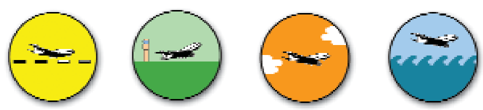
Monitoring and Maintenance Capability



Monitoring and maintenance includes the activities necessary to monitor NAS status, detect and isolate failures and outages, and perform corrective and preventive maintenance to ensure NAS operational readiness.

Evolution of this capability will increase operational readiness through better management of maintenance resources using remote monitoring of equipment status and interactive diagnostic, corrective, and preventive maintenance.

Spectrum Management Capability



Spectrum management concerns securing, protecting, and managing the radio spectrum for the FAA and the U.S. aviation community. The available spectrum is limited and in great demand. The aviation community is one of the major U.S. users of the radio frequency spectrum. In fact, the top three spectrum users in the Federal government are the FAA, the Air Force, and the Navy; the FAA has over 50,000 frequency assignments. Virtually all FAA CNS systems are dependent on use of the radio frequency spectrum. Numerous aircraft systems, including airborne weather radar, are users of the spectrum.

International spectrum usage is governed by the International Telecommunication Union (ITU), an agency sponsored by the United Nations. The ICAO is the primary entity for establishing international civil aviation standards for worldwide system interoperability. The FAA represents the U.S. in both the ITU and the ICAO. The FAA will continue to work with both the ITU and the ICAO to ensure the efficient use of spectrum worldwide.

Enabling Systems

NAS Infrastructure Management System (NIMS) contributes to or enables the efficient delivery of the infrastructure/information services. Additionally, NEXCOM, used in the ATC advisory service, will contribute to infrastructure/information services.

NAS Infrastructure Management System (NIMS)

NIMS provides automated operations support for new centralized National/Operations Control Centers (NOCC/OCC) and field specialists. This new approach to the operation and maintenance of the NAS infrastructure incorporates a performance-based service management approach that will achieve user and customer satisfaction and manage NAS infrastructure services. NIMS is based on the use of COTS products to provide the functionality required. NIMS will allow remote monitoring and control of both legacy and new NAS subsystems using industry standard management interfaces and protocols. Management of resources such as spares, test equipment, specialists, logging of equipment/services outages, and recording maintenance activities will also be provided.

NIMS functions include equipment monitoring, control, event management, fault management, performance management, workforce management, resource management, operational configuration management, report logging, archiving, and generation, security management, and support functions.

Current Status and Future Plans - In May 2000, the FAA approved the funding for NIMS Phase 2 for 2001-2005. In 2001, IOC for the NOCC/OCCs was achieved and seven General NAS Maintenance Control Centers were consolidated into OCCs.

NIMS Phase 2 will focus on fully implementing resource management with cost and performance metrics. NIMS functionality will be deployed to 33 service operations centers and more than 300 work centers.

Traffic Management Strategic Flow Service

The strategic flow service provides for orderly flow of air traffic from a NAS perspective. NAS capacity and demand is analyzed and balanced to minimize delays, avoid congestion, and maximize throughput, flexibility, and predictability. Actual and predicted demand are compared to current and predicted capacity of the airspace, airports, and infrastructure to plan overall NAS strategy.

When necessary, TFM plans are developed collaboratively to optimize the flow of traffic while accommodating user requests and schedules, airspace, infrastructure, weather constraints, and other variables. The strategic flow service comprises current performance assessment, flight-day management (current 24-hour period), and long-term planning (more than 1 day in advance).

Current Performance Assessment Capability

Performance assessment provides institutional memory, without loss due to retiring employees or replacing equipment, by archiving information to support post-flight analyses of NAS traffic flow.

The performance assessment capability will continue to improve with the evolution of existing tools, such as Post Operations Evaluation Tool (POET).

Flight-Day Management Capability

Flight-day management optimizes NAS traffic flow for the current 24-hour period.

This capability will continue to improve with the evolution of existing decision-support tools and introduction of new tools to increase flexibility to manage flight operations under constraints (e.g., SUA, equipment and facility status, and weather conditions).

Related OEP Solution Sets

AD-3: Redesign Terminal Airspace and Routes
AD-6: Coordinate for Efficient Surface Movement
AW-3: Reconfigure Airports Efficiently
ER-2: Collaborate to Manage Congestion
EW-1: Provide Better Hazardous Weather Data

Long-Term Planning Capability

The long-term planning capability predicts capacity and demand more than one day in advance and validates capacity and demand models. Tools such as POET and Flight Schedule Monitor (FSM) are used to support long-term planning.

Evolution is toward strategic adjustments to personnel assignments, resulting in a better match of sectorization and staffing to anticipated flows.

Enabling Systems

The systems described below contribute to or enable the efficient delivery of traffic management strategic flow services.

Post Operations Evaluation Tool (POET)

POET is an analysis system used by the ATCSCC, ARTCCs, other FAA facilities, and NAS users to identify and analyze ATC system-wide problems. POET allows users to explore NAS functions, using a variety of performance metrics, including departure, En Route, and arrival delays, and filed-versus-actually-flown flight tracks.

Current Status and Future Plans - The POET server is installed at the ATCSCC and has access to archived ETMS data. These data are updated daily and the server maintains a “rolling” 45-day data set spanning the NAS for ready analysis by POET. Users can easily access, filter, and visualize the flight information contained in the ETMS data archive using a variety of interactive charts, tables, and geographic displays. POET has a built-in collection of powerful data-mining tools to assist the user in recognizing data patterns and trends. Access by CDM airlines to Near Real-Time POET was completed on March 5, 2002. The next phase of POET development will involve connectivity through the Internet for non-FAA users.

Flight Schedule Monitor (FSM)

FSM allows FAA and airline CDM users to monitor and manage airport demand and capacity. The ATCSCC uses FSM to coordinate Ground Stop and Ground Delay Program (GDP) strategies when capacity/demand imbalances occur.

Current Status and Future Plans - FSM is used by more than 30 FAA facilities and 30 airlines in the U.S. and Canada. FSM is available as freeware to any system operator (e.g., airlines and GA) who signs a Memorandum of Agreement with the FAA. Future enhancements will include distance-based GDPs, multi-fix GDPs, and multiple-airport GDPs.

Enhanced Traffic Management System (ETMS)

ETMS is an existing computer system used to track, predict, and plan air traffic flow, as well as to analyze ground delay effects and to evaluate alternative routing strategies. ETMS is the heart of the TFM-Infrastructure. ETMS helps coordinators respond strategically to situations across the NAS rather than focus on only local solutions. This broader viewpoint reduces NAS-wide delays and annually saves millions of dollars in aviation fuel costs.

Current Status and Future Plans - The DOT Volpe National Transportation Systems Center operates the ETMS hubsite 24 hours per day, 7 days a week. Enhancements are introduced with periodic software releases.

Collaborative Decision Making (CDM)

CDM provides AOCs and the FAA with real-time access to NAS status information, including weather, equipment availability, and delays. This information sharing enables collaboration between the FAA and the airlines, which leads to more efficient airspace management. The initial three components of CDM are GDP Enhancements, Initial Collaborative Routing, and NAS Status Information.

Current Status and Future Plans - Over 30 airlines and NAV CANADA are currently enrolled as users of the system. The Strategic Planning Teleconference (SPT) was initiated in 2000 to improve system predictability. The SPT is a collaborative effort where participants actively seek the most advantageous mitigation to an airport/airspace constriction in the NAS. The ATCSCC sets the agenda and coordinates these teleconferences with participation from personnel from FAA field facilities and the airlines. This collaboration allows both the FAA and users to plan and execute daily flight operations. FFP2 will deploy CDM with CRCT functionality on the TFM-Infrastructure to 20 ARTCCs and the ATCSCC.

FFP2 CDM initiatives include Enhanced Data Exchange (formerly NAS Status Information), Enhanced Arrival and Departure Management (formerly Ground Delay Program Enhancements), Congestion Management (formerly Initial Collaborative Routing), Performance Assessment, and Impact Assessment.

The NAS-wide Information System will provide an exchange of electronic data and increase collaboration between NAS users and service providers. With this increased exchange of information, carriers will be able to adjust their schedules to maximize safety and efficiency, since flight data, including the filed flight profile and amendments, and up-to-date flight schedules, will be readily available to NAS users. The FAA will also make airlines aware when equipment needs to be serviced so the airlines can change schedules to increase efficiency.

Collaborative Routing Coordination Tools (CRCT)

CRCT is a concept development prototype system that evaluates and identifies a limited set of critical functions, including: designating airspace with severe weather or congestion as a Flow Constrained Area (FCA); identifying all flights predicted to enter the FCA; creating and assessing the impact of rerouting strategies; and facilitating collaborative routing decisions for efficient and safe use of the NAS.

Current Status and Future Plans - Prototype CRCTs have been installed for evaluation purposes in Kansas City, Indianapolis, and the ATCSCC. CRCT will be further developed with CDM in FFP2. Methods of processing weather data to optimize performance will be investigated.

Common Constraint Situation Display (CCSD)

The Common Constraint Situation Display (CCSD) is a new traffic management capability to be provided through a Web browser that will share CRCT functionality information with AOCs. The CCSD will be able to share FCA and impacted flights and sector overlay and loading information based on monitor alert data. Future releases will include Collaborative Convective Forecast Product (CCFP).

Current Status and Future Plans - The CCSD can be accessed via the ATCSCC Web site and CDMnet. A new version of the CCSD, delivered in early 2002, provides additional constraint management information (CCSD now displays public reroutes) and incorporates CCFP.

Collaborative Convective Forecast Product (CCFP)

CCFP is a process that begins with an initial convective weather forecast for the next 2–6 hours being produced every 4 hours by the Aviation Weather Center in Kansas City. This forecast then evolves into a final product through collaboration by participating meteorologists at the airlines, various Center Weather Service Units, and the Aviation Weather Center.

Current Status and Future Plans - The CCFP is now available in the Traffic Situation Display (TSD), the main ETMS user interface. Improved convective products will be implemented on ETMS in May 2003.

Route Management Tool (RMT)

The Route Management Tool (RMT) offers a national routes database updated in 56-day intervals that facilitates the timely dissemination and implementation of reroutes. RMT manages the Coded Departure Route (CDR) database (severe weather routes). CDRs are used to reduce coordination time during severe weather or departure congestion events and to standardize route coordination for users.

Current Status and Future Plans - RMT was initially deployed in April 2000, and can be accessed via the CDMnet or via the ATCSCC Web site. Future RMT versions may include Miles-In-Trail monitoring, National Playbook database management, and CCFP display capability.

Sector Management Tool (SMT)

The Sector Management Tool (SMT) is a prototype ETMS feature that helps traffic managers develop "what-if" solutions to predict sector traffic-loading problems by assigning ground delays. It calculates the minute-by-minute traffic load in a sector and then applies a smoothing method to reduce projected traffic to the capacity threshold.

Current Status and Future Plans - Traffic managers at selected ARTCCs and the ATCSCC are evaluating SMT to determine its operational suitability. Deployment of SMT will be based on the results of the overall operational suitability assessment.

National Playbook

The National Playbook is one of several initiatives underway to improve NAS performance using CDM. The National Playbook is a collection of Severe Weather Avoidance Plan routes that are pre-validated and coordinated with impacted ARTCCs. It is designed to mitigate potential adverse impacts to users and the FAA during periods of severe weather or other events that affect the NAS.

Current Status and Future Plans - The National Playbook is in place and is coordinated by the ATCSCC.